STARVATION

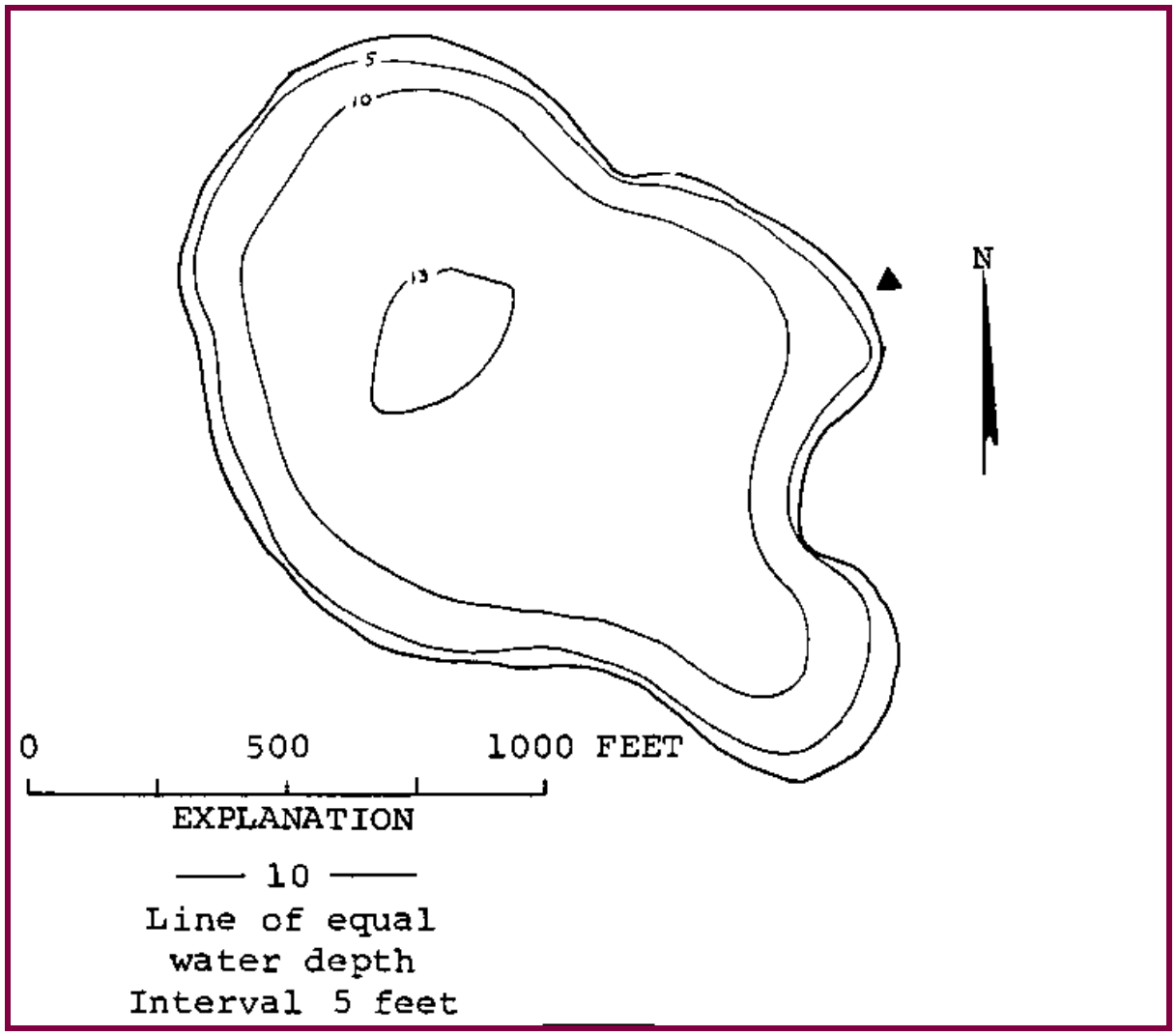
STEVENS County

Lake ID: STAST1

Ecoregion: 8

Starvation Lake is located eight miles southeast of Colville in the Colville National Forest. It is fed by a small creek and has no outlet.

Area (acres)	*Maximum Depth (ft)*	*Mean Depth (ft)*	*Drainage (sq mi)*	
30	14	8	3	
Volume (ac-ft)	***Shoreline (miles)***	***Altitude (ft abv msl)***	***Latitude***	***Longitude***
233	0.88	2375	48 29 24.	117 42 27.



Station Information

STAST1

Primary Station Station # 1 latitude: 48 29 17.0 longitude: 117 42 45.0

Description: Deep part of lake: just northwest of center.

Trophic State Assessment for 1999

STARVATION

Analyst: Sarah O'Neal

TSI_Secchi:	[a]	44	BN
TSI_Phos:		65	
TSI_Chl:		58	
Narrative TSI:	[b]	E	

Starvation Lake is a small, shallow, highly productive lake located in the Colville National Forest. About twelve people lived around the lake in five homes, several of which appeared to use fertilizers. Varying numbers of cattle grazed in a pasture on the north shore. They occasionally grazed very close to the water. High numbers of both geese and ducks also used the lake as habitat. A wetland surrounded much of the southeastern shore. There were no apparent best management practices in use to prevent watershed activities from impacting the water quality of the lake. The lake lacked buffer zones. A cattle exclusion fence along the inlet stream is needed. High nutrient levels in the lake indicate eutrophy. Some internal nutrient loading probably resulted from apparent hypolimnetic anoxia. Weak or intermittent stratification allowed these nutrients to be periodically cycled into the epilimnion. This resulted in dense plant and algae growth. The macrophyte community was dense, and dominated by one submerged plant, and one floating-leaved plant. The lake experienced tremendous algae blooms for three years prior to sampling, the first of which caused a major summer die off of rainbow trout. Algae decreased toward the end of summer, causing steadily increasing Secchi readings. Total phosphorus concentrations were quite a bit higher than they were during a 1990 survey.

WDFW managed the lake primarily for rainbow trout. About 18,000 were planted each spring. Characteristic of a productive lake, the zooplankton community exhibited a large average size that decreased somewhat toward the end of summer, indicating utilization by planktivores and a possibly ineffective number of piscivores to balance planktivore numbers. Starvation was an extremely popular trout fishing lake with a short take season that lasted from opening day until the end of May. Uses changed to mostly camping and some fly fishing after the first of June. Only two surveys were completed; one respondent also indicated watching wildlife as a primary activity. Many coots, other ducks, turtles, and osprey lived in and around the lake. Questionnaires indicated poor water clarity and aquatic plants as main detractors from the lake, while views, Canada geese, good coldwater fishing, and restricted watercraft were assets.

While surrounding watershed activities clearly impacted the lake, primary uses were largely supported by the eutrophic state of this productive lake. There was evidence of degradation of water quality. Pending a more thorough study, including a nutrient

budget analysis, we recommend a tentative total phosphorus criterion of 90.0 ug/L (mean 68.4 ug/L plus standard deviation of 21.6 ug/L). Future studies will likely recommend lowering this criterion. In the meantime, best management practices should be implemented in the watershed.

Mean Secchi = 3.1m (BN); Mean TP = 68.4 ug/L; Mean Chl = 16.1 ug/L

[a] TSI Qualifiers: B or W-Secchi Disk hit bottow or entered weeds; J-Estimate; N-Fewer than the required number of samples

[b] E=eutrophic, ME=mesoeutrophic, M=mesotrophic, OM=oligomesotrophic, O=oligotrophic

Chemistry Data

STARVATION

Date	Time	Strata	Tot P (ug/L	Tot N (mg/L)	TN:TP	Chloro-phyll (ug/L)	Fecal Col. Bacteria (#/100mL)	Hardness (mg/L)	Calcium (ug/L)	Turbidity (NTU)
Station 0										
6/15/1999		L					1			
7/13/1999		L					4			
8/10/1999		L					1			
9/14/1999		L					1			
Station 1										
6/15/1999		E	60.3	.998	17	28		164	46700	4.6
		H	57	.625	11					
7/13/1999		E	43	1.03	24	13.2				2.7
		H	66.9	1.19	18					
8/10/1999		E	39.9	1.19	30	20.5				2.1
		H	49.5	1.18	24					
9/14/1999		E	109	1.14	10	3.8				.8

Strata: L=lake surface, E=epilimnion, H=hypolimnion; Qualifier: J=Estimate, U=Less than, G=Greater than.

Watershed Survey

STARVATION

Survey Date: 9/14/1999

Land Uses (1 = Primary, 2 = Secondary, etc.)

- [1] **Agriculture(commercial, not hobby)**
- [ ] **Commercial, Industrial**
- [ ] **Major transportation**
- [2] **Residential**
- [3] **Park, forest or natural**

Impervious surfaces (Roads and parking area): No Curbs

Observations (check mark denotes presence)

BMP's ☐

None. Could use cattle exculsion along inlet stream.

Odors ☐

Cattle ☐ **Ducks** ☑ **Geese** ☑

Geese were under a willow on southwest shore.

Fertilizers and weed killers appear to be used in residential or agriculture area ☑

Probably used by a cluster of homes near the south shore.

Buffer zones around streams and wetlands ☐

None noted. Could use cattle exclusion along inlet stream.

Irrigation ☐

Unknown

Survey Id: 1

Habitat Survey Summary Report

STARVATION

Data are averages of ***10*** **Stations Surveyed** **Date of Visit:** 7/26/1999

Vegetation Type (Avg. only of sites w/ vegetation present; 1=coniferous, 3=deciduous)

Canopy Layer Avg:	2.5	**Number of stations with canopy:**	8
Understory Avg:	2.9	**Number of stations with understory:**	8

Percent Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

Canopy Layer:	**trees > 0.3 m DBH**	1.0
	trees< 0.3 m DBH	1.5
Understory:	**woody shrubs saplings**	1.4
	tall herbs, forbs grasses	2.6
Ground Cover:	**woody shrubs seedlings**	1.0
	herbs, forbs, grasses	1.9
	standing water or inundated veg	2.4
	barren or buildings	0.0
Substrate Type (within shoreline plot):	**bedrock**	0.0
	boulders	0.0
	cobble/gravel	0.0
	loose sand	0.0
	other fine soil/sediment	0.0
	vegetated	4.0
	other	0.0
Bank Features:	**angle (O:<30; 1: 30-75; 2:nr vertical)**	0.4
	vertical dist (M from wtrln to high wt):	0.2
	horiz. dist. (M from wtrln to high wt):	1.0

Human Influence (0 = absent, 1 = adjacent to or behind plot, 2 = present within plot)	
buildings	0.3
commercial	0.0
park facilities	0.2
docks/boats	0.4
walls, dikes, or revetments	0.0
litter, trash dump, or landfill	0.0
roads or railroad	0.0
row crops	0.0
pasture or hayfield	0.6
orchard	0.0
lawn	0.3
other	0.0

Physical Habitat Characteristics	
station depth (m; at 10 m from shore)	2.1

Bottom Substrate (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)	
bedrock	0.0
boulders	0.0
cobble	0.0
gravel	0.0
sand	0.0
silt	4.0
woody debris	0.2

Macrophyte Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)	
submergent	2.2
emergent	1.4
floating	2.5
total weed cover	3.9
Do macrophytes extend lakeward (-1 = yes, 0 = no)	-1.0

Fish Cover (0 = absent, 1 = Present but sparse, 2 = moderate to heavy)	
aquatic weeds	2.0
snags	0.0
brush or woody debris	0.5
inundated live trees	0.0
overhanging vegetation	0.2
rock ledges or sharp dropoffs	0.0
boulders	0.0
human structures	0.2

Questionnaire

STARVATION

Results compiled from 2 **Surveys.** **Average time (years) respondents spent on lake:** 8.00

Did the following add (+1), detract (-1), or have no effect (0) on your enjoyment of the lake today?

Types of WaterCraft:	-0.5	View:	1.0	Distance to Lake:	0.5
Public Access:	0.5	Swim Beach:	0.0	Canada Geese:	1.0
Water Clarity:	-1.0	Water Qual. for Swim:	0.0		
Fishing Quality:	0.5	Aquatic Plants:	-1.0		

On a scale of 1 (poor) to 5 (excellent), how would you rate water quality today? **2.0**

Which would you rather have, 1 or 2?

1) Better fishing and more natural habitat, or 2) clearer water?	1.0
1) Better fishing and more natural habitat, or 2) fewer aquatic plants?	1.0
1) Clearer water, or 2) fewer aquatic plants?	2.0

How important is each of the following characteristics to you (1 = very undesirable, 5= very desirable):

Restricted Watercraft:	4.5	Good Warmwtr Fishing:	2.5	Natural Scenery:	4.5
Plant Growth:	3.5	Good Swimming:	3.5	Public Beach:	3.0
Natural Shoreline:	3.0	Less Algae:	4.0	Canada Geese:	4.0
No Odors:	4.0	Public Access:	4.0		
Good Coldwtr Fishing:	4.5	Clear Water:	4.0		

Tabulated Results

Survey ID	Date	Residency		Rent or Own	Primary Activity*	Water Clarity: Purchase Factor?	Water Clarity: Has it Changed?	Water Clarity: When?
223	12/15/1999	Resident	Permanent	Rent	7	☐	Worse	11
226	12/31/1999	Visitor			2	☐	No	

We're seniors and this is one of very few places where there is no charge for camping. We appreciate that. [Survey submitted 2000/04/28]

* 1=canoe/kayak, 2=fish, 3=pers. wtrcrft, 4=mtrboat, 5=sail, 6=swim/wade, 7=watch wldlf, 8=ski, 9=windsurf, 10=relaxing

Zooplankton Report

STAST1

Date 6/15/1999 Station: 1
Sample ID 70

Number of organisms measured: #Delet

Group	Percent
Cladocera	#Deleted
Copepod	#Deleted
Other	#Deleted

Group	Percent
Small < 1mm	#Deleted
Large >= 1mm	#Deleted
Ratio of large to Smal	#Num!
Average size (mm):	1.09

Date 8/10/1999 Station: 1
Sample ID 40

Very opaque sample, full of algae (?). Difficult to distinguish smaller zooplankton.

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.72

Aquatic Plant Data

STARVATION

Sampler: Parsons, O'Neal

Survey Date: 7/26/1999

Max depth of growth (M): 4

Comments Sunny, calm. Water green, murky. Many coots, other ducks, turtles. Habitat survey done. Productive lake. Popular fishing spot--no bait, barbless during much of the year. Much of shoreline wetland, homes along south hill. Many Nuphar rhizomes floating on surface.

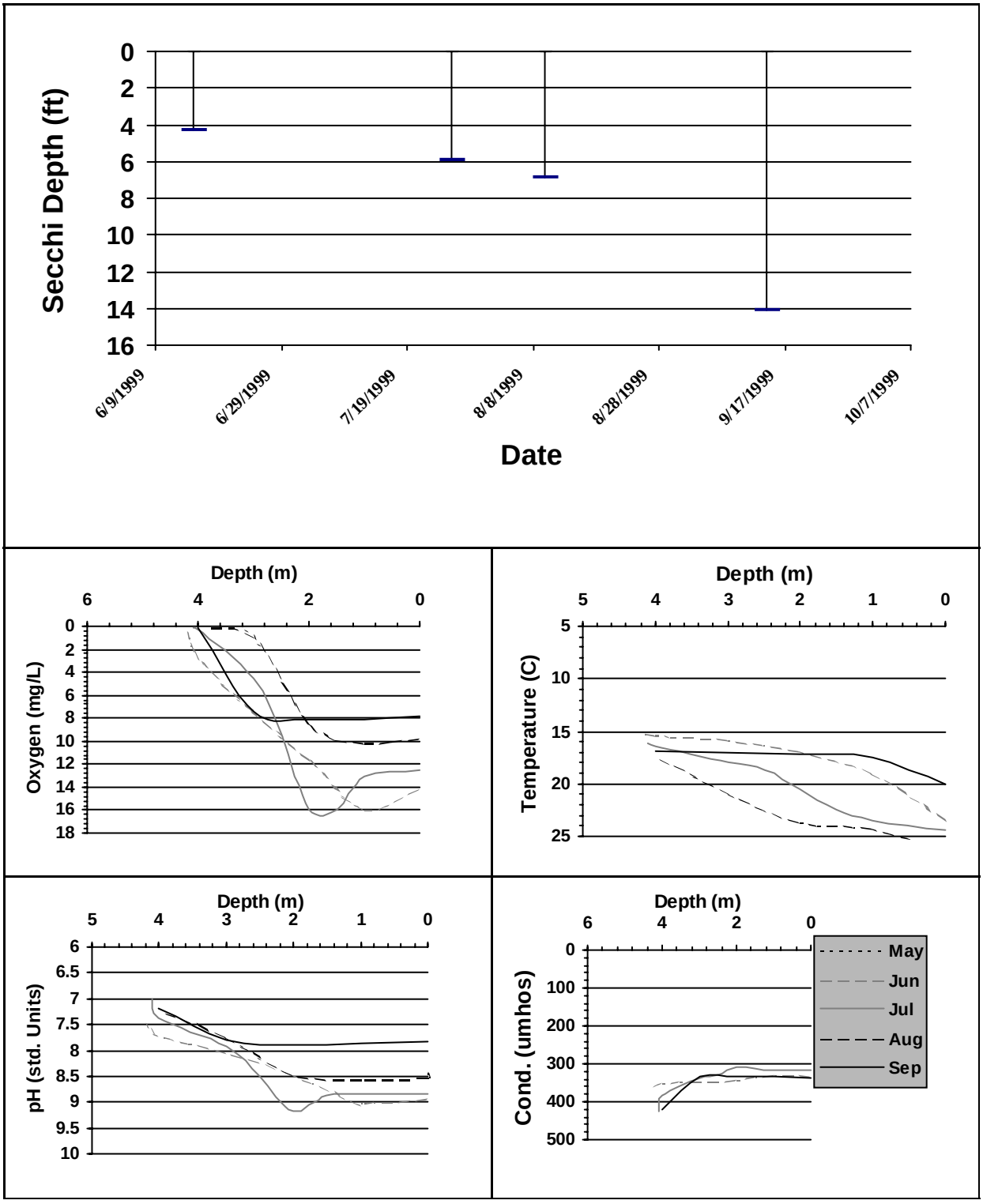
SPECIES LIST

Scientific Name	Common Name	Dist [a]	Comments
Ceratophyllum demersum	Coontail; hornwort	4	dominant submersed plant, throughout lake
Nuphar polysepala	spatter-dock, yellow water-lily	4	to ~2.5 m rings lake, many rhizomes floating on surface
Potamogeton pectinatus	sago pondweed	2	
Potamogeton sp (thin leaved)	thin leaved pondweed	1	
Scirpus sp.	bulrush	2	bulrush
Typha latifolia	common cat-tail	3	

[a] 0 - value not recorded (plant may not be submersed)
1 - few plants in only 1 or a few locations
2 - few plants, but with a wide patchy distribution
3 - plants in large patches, codominant with other plants
4 - plants in nearly monospecific patches, dominant
5 - thick growth covering substrate to exclusion of other species

Secchi Depth and Profile Graphics

Station: 1 STAST1



Secchi Data and Field Observations

Date	Time	Temp-erature (F)	Secchi (ft)	Color (1-greens, 11-browns	Bright-ness (pct)	Wind (1-none, 5-gusty)	Rainfall (0-none, 5-heavy)	Aesthetics (1-bad, 5-good)	Swimming (1-poor, 5-good)	Geese (#)	Waterfowl (besides geese #)	Boats-Fishing (#)	Boats-Skiing (#)
Station 1													
6/15/1999			4.3	7	5	2	1	2	1	7	40		
	Sampler: HALLOCK			Remarks:	Bottom: 4.2M. ~20 cattle but not w/in 100ft of lake. 1M oxygen high--off scale. Other waterfowl mostly coots. All fecal coliform samples from this lake were collected from end of pier the day after collecting other samples. Dissolved oxygen measurement qualified as an estimate due to calibration failing QA/QC requirements.								
7/13/1999					0	2	1	2	1	12	45		
	Sampler: HALLOCK			Remarks:	bottom: 4.2M. No Secchi reading! 1.5-2.5M oxygen off scale (probably entered coontail mat). Curt Vail (DFW) says ~12 people live on the lake in 5 houses. ~30 cattle. Lots of algae, lots of turtles. Waterfowl are mostly coots, 1 osprey. Dissolved oxygen measurement qualified as an estimate due to calibration failing QA/QC requirements.								
7/26/1999			5.91										
	Sampler: Parsons			Remarks:									
8/10/1999			6.9	6	5	2	1	2	1	0	45		
	Sampler: HALLOCK			Remarks:	Bottom 3.9M. Stevens Co. Cons. Dist. will be continuing to study the lake next year. Starvation is very popular for fishing early in the season and has excellent opening day catch statistics. Dissolved oxygen measurement qualified as an estimate due to calibration failing QA/QC requirements.								
9/14/1999			14.11 B	6	1	1	1	2	1	14	40		
	Sampler: HALLOCK			Remarks:	Bottom: 4.0M. Secchi visible on bottom. Still plenty of Anabaena or Microcystis (?) clumps but water is much clearer than previously. Bottom sediments very soft. Not stratified.								